

IN THE SPECIFICATION:

Please replace paragraph number [0001] with the following rewritten paragraph:

[0001] This application is a continuation of application Serial No. 10/156,976, filed May 29, 2002, ~~pending now~~ U.S. Patent 6,605,489, issued August 12, 2003, which is a continuation of application Serial No. 09/642,134, filed August 18, 2000, now U.S. Patent 6,399,416, issued June 4, 2002, which is a continuation of application Serial No. 09/390,889, filed September 7, 1999, now U.S. Patent 6,140,149, issued October 31, 2000, which is a continuation of application Serial No. 08/914,719, filed August 19, 1997, now U.S. Patent 6,071,754, issued June 6, 2000, which is a continuation of application Serial No. 08/752,802, filed November 20, 1996, now U.S. Patent 5,696,031, issued December 9, 1997. The present application is also related to application Serial No. 08/602,503, filed February 20, 1996.

Please replace paragraph number [0004] with the following rewritten paragraph:

[0004] Accordingly, a variety of compact die packaging techniques exists. In one such technique, the back-side surface of a bare IC die is directly mounted on the surface of a Printed Circuit Board (PCB), and bond pads on the front-side surface of the bare die are then ~~wire-wire~~-bonded to wire-bondable pads on the surface of the PCB to interconnect circuitry in the die with external circuitry through conductive traces on the PCB. This technique may be referred to as “Chip-On-Board (COB) with wire-bonding.” In another such technique, conductive “bumps” on the front-side surface of a bare IC die are bonded to “flip-chip” pads on the surface of a PCB to interconnect circuitry in the die with external circuitry. Both the COB with wire-bonding technique and the flip-chip technique are well known to those of skill in the field of this invention, and are described in more detail in U.S. Patent Nos. 5,422,435, 5,495,398, 5,502,289, and 5,508,561.

Please replace paragraph number [0005] with the following rewritten paragraph:

[0005] While these traditional compact die packaging techniques are more compact than the bulky die packages described above, they still are not compact enough for some multi-multi-chip applications requiring many chips in a small area. For example, an ever-growing demand for Dynamic Random Access Memory (DRAM) capacity is driving a need for ever-more DRAM memory chips to be packed into a small area.

Please replace paragraph number [0007] with the following rewritten paragraph:

[0007] While all of these stacking techniques work well to increase the density of chips provided in a given area, they do not provide a simple stacking technique for IC dice flip-chip mounted to a PCB in the manner described above. They also do not provide a stacking technique that can be used to repair or replace a defective IC die flip-chip mounted to a PCB. Such “repair” stacking techniques are well known for IC dice mounted to a PCB using the COB with wire-wire-bonding technique, as described in U.S. Patent No. 4,567,643.

Please replace paragraph number [0010] with the following rewritten paragraph:

[0010] In another embodiment of the present invention, a memory device includes one or more electronic devices, as described above. In a further embodiment, an electronic system includes input, output, memory, and processor devices, and one of these devices includes a base, first IC die, and second IC die, as described above. In still further embodiments, the wire-wire-bondable and flip-chip pads of the electronic device, described above, are interconnected in single and multiple layers of the base.

Please replace paragraph number [0011] with the following rewritten paragraph:

[0011] In an additional embodiment, an electronic device, as described above, also includes a third IC die back-side attached to the second IC die and then wire-bonded to the wire-wire-bondable pads on the surface of the base. In a still additional embodiment, an electronic

system includes input, output, memory, and processor devices, and one of these devices includes a base and first, second, and third IC dice, as described above.

Please replace paragraph number [0020] with the following rewritten paragraph:

[0020] As shown in FIG. 1, an inventive Multi-Chip Module (MCM) 10 includes a flip-chip integrated circuit (IC) die 12 with flip-chip bumps (not shown) on its front-side surface 16, reflow-soldered in a well-known manner to flip-chip pads (not shown) screen printed on a surface 20 of a printed circuit board (PCB) 22. Circuitry (not shown) within the flip-chip IC die 12 communicates with external circuitry (not shown) through conductors 24 connected to the flip-chip pads (not shown). Although the present invention will be described with respect to the MCM 10, it will be understood by those having skill in the field of the invention that the invention includes within its scope a wide variety of electronic devices other than MCMs, including, for example, memory devices such as Single In-line Memory Modules (SIMMs) and Dual In-line Memory Modules (DIMMs). It will also be understood that the flip-chip IC die 12 may comprise any IC die having flip-chip bumps, and that the flip-chip IC die 12 may be bonded to the flip-chip pads (not shown) using methods other than reflow soldering. Further, it will be understood that the flip-chip pads (not shown) may be provided on the surface 20 using a method other than screen printing, such as selective plating, and that the present invention includes within its scope bases other than the PCB 22.

Please replace paragraph number [0021] with the following rewritten paragraph:

[0021] A wire-bondable IC die 26 is stacked on top of the flip-chip IC die 12. This may be done, for example, to increase the amount of Dynamic Random Access Memory (DRAM) provided on the PCB 22 if the IC dice 12 and 26 are DRAM IC dice. It may also be done to replace the flip-chip IC die 12 with the wire-bondable IC die 26 if the flip-chip IC die 12 is defective. Of course, it will be understood that the wire-bondable IC die 26 may be any wire-wire-bondable IC die.

Please replace paragraph number [0024] with the following rewritten paragraph:

[0024] If the wire-bondable IC die 26 is being used to replace a defective flip-chip IC die 12, communication between the defective flip-chip IC die 12 and external circuitry (not shown) is interrupted by cutting the conductors 24 at locations proximate to each of the flip-chip pads (not shown). Of course, the present invention includes within its scope other methods for interrupting communication between the flip-chip IC die 12 and external circuitry, including, for example, de-selecting or de-powering the flip-chip IC die 12. With communication between the flip-chip IC die 12 and external circuitry interrupted, the wire-bondable IC die 26 communicates with external circuitry through the conductors 24 without interference from the defective flip-chip IC die 12.

Please replace paragraph number [0026] with the following rewritten paragraph:

[0026] A method of assembling the MCM 10 includes: screen printing or selectively plating the flip-chip pads (not shown) and wire-bondable pads 30; picking and placing the flip-chip IC die 12; reflow soldering the flip-chip bumps (not shown) to the flip-chip pads (not shown); testing the connection between the flip-chip bumps (not shown) and the flip-chip pads and, if the connection fails the test, repairing the connection; underfilling the flip-chip IC die 12; picking and placing the wire-bondable IC die 26; back-bonding the IC dice 12 and 26 to one another with un-cured epoxy; curing the epoxy; wire-bonding the bond pads on the wire-wire-bondable IC die 26 to the wire-bondable pads 30; testing the connection between the bond pads and the wire-bondable pads 30 and, if the connection fails the test, repairing the connection; and encapsulating the IC dice 12 and 26.

Please replace paragraph number [0027] with the following rewritten paragraph:

[0027] As shown in FIG. 2, the MCM 10 includes an additional IC die 32 back-side attached to the wire-bondable IC die 26 and wire-bonded to the bond pads of the wire-bondable IC die 26. As a result, the density of dice on the PCB 22 is increased. Of course, although only one additional IC die 32 is shown in FIG. 2 stacked on top of the wire-bondable IC die 26, the

present invention includes within its scope multiple dice stacked on top of the wire-bondable IC die 26.

Please replace paragraph number [0029] with the following rewritten paragraph:

[0029] As shown in FIG. 3B in a portion of an alternative interconnection arrangement, the IC dice 12 and 26 are identical with respect to the arrangement of their bond pads and the functions associated with their respective bond pads. As a result, the bond pads of the flip-chip IC die 12 are oriented in a “flipped” relationship with respect to the bond pads of the wire-wire-bondable IC die 26. Consequently, flip-chip pads 34 on the PCB 22 are interconnected with wire-bondable pads 36 on the PCB 22 through different layers 37 and 38 in the PCB 22 so bond pads on each of the IC dice 12 and 26 that are associated with the same function are interconnected, thus allowing both IC dice 12 and 26 to operate in parallel. The flip-chip pads 34 may be said to then “electrically mirror” the wire-bondable pads 36. Of course, it will be understood that a wide variety of multi-layer PCB interconnection arrangements which vary widely from that shown in FIG. 3B are within the scope of the present invention.